

## Department of Electrical and Electronics Engineering

### COURSE MODULES OF THE SUBJECT TAUGHT FOR THE EVEN SESSION 2024-25

#### Course Syllabi with CO's

Faculty Name: Sowmyashree K S				Academic Year: 2024-25			
Department: Electrical & Electronics Engineering							
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BEE401	ELECTRIC MOTORS	Core	Engineering Physics, Basic Electrical Engineering	3			40
Objectives	1. To study the constructional features of Motors and select a suitable drive for specific application. 2. To study the constructional features of Three Phase and Single-phase induction Motors. 3. To study different test to be conducted for the assessment of the performance characteristics of motors. 4. To study the speed control of motor by a different method. 5. Explain the construction and operation of Synchronous motor and special motors.						
Topics Covered as per Syllabus							
<b>Module-1</b> <b>DC Motors: Construction and Classification,</b> Back emf, Torque equation, and significance of back emf, Characteristics of shunt, series & compound motors. Speed control of shunt. Application of motors <b>Losses and efficiency-</b> Losses in DC motors, power flow diagram, efficiency, condition for maximum efficiency. <b>Testing of dc motors:</b> Direct & indirect methods of testing of DC motors-Brake test, Swinburne’s test, Retardation test, Hopkinson’s test, Field’s test, merits and demerits of tests.Numerical as applicable. <b>8 Hours</b>							
<b>Module-2</b> <b>Three phase Induction motors:</b> Concept and generation of rotating magnetic field, Principle of operation, construction, classification and types; squirrel-cage, slip-ring. Slip, Torque equation, torque-slip characteristic covering motoring, generating and braking regions of operation. Maximum torque, significance of slip. Numerical as applicable. <b>8 Hours</b>							
<b>Module-3</b> <b>Performance of three-phase Induction Motor:</b> Phasor diagram of induction motor on no-load and on load, equivalent circuit, losses, efficiency, No-load and blocked rotor tests. Performance of the motor from the circle diagram and equivalent circuit. Cogging and crawling. High torque rotors-double cage and deep rotor bars. Equivalent circuit and performance evaluation of double cage induction motor. Induction motor working as induction generator; standalone operation and grid connected operation. <b>8 Hours</b>							
<b>Module-4</b> <b>Starting and speed Control of Three-phase Induction Motors:</b> Need for starter. Direct on line, Star-Delta and autotransformer starting. Rotor resistance starting. Speed control by voltage, frequency, and rotor resistance methods. <b>Single-phase Induction Motor:</b> Double revolving field theory and principle of operation. Construction and operation of split-phase, capacitor start, and capacitor run, and shaded pole motors. Comparison of single-phase motors and applications. <b>8 Hours</b>							

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<b>Module-5</b> <b>Synchronous motor:</b> Principle of operation, phasor diagrams, torque and torque angle, Blondel diagram, effect of change in load, effect of change in excitation, V and inverted V curves. Synchronous condenser, hunting and damping. Methods of starting synchronous motors. <b>Other motors:</b> Construction and operation of Universal motor, AC servomotor, Linear induction motor and stepper motors. <b>8 Hours</b>	
<b>List of Text Books</b>	
<b>TEXTBOOKS:</b> <b>1. Electric Machines</b> by D. P. Kothari, I. J. Nagrath, Mc Graw Hill, 4th edition, 2011 <b>2. Electric Machinery and Transformers</b> , Irving Kosow, Pearson, 2 <sup>nd</sup> Edition, 2012	
<b>List of Reference Books</b>	
<b>1. Theory of Alternating Current Machines</b> , by Alexander Langsdorf, Mc Graw Hill, 2nd Edition, 2001	
<b>List of URLs, Textbooks, Notes, Multimedia Content, etc</b>	
<b>1. Electric Machines</b> , Ashfaq Husain, Third edition, Dhanpat rai and co. <b>2. <a href="http://nptel.ac.in/">http://nptel.ac.in/</a></b>	
<b>Course Outcomes</b>	<b>At the end of the course the student will be able to:</b> 1. Explain the constructional features of Motors and select a suitable drive for specific application. [L2] 2. Analyze and assess the performance characteristics of DC motors by conducting suitable tests and control the speed by suitable method. [L4] 3. Explain the constructional features of Three Phase and Single-phase induction Motors and assess their performance. [L4] 4. Control the speed of induction motor by a suitable method and explain the operation of Synchronous motor and special motors. [L2] 5. Explain the starting methods, equivalent circuit and phasor diagrams, torque angle, effect of change in excitation and change in load, hunting and damping of synchronous motors. [L2]
Internal Assessment Marks: 50	

### The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Course Code:	BEE401	TITLE: Electric Motors						Faculty Name:	Sowmyashree K S			
List of Course Outcomes	Program Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO-1	3	-	-	-	-	-	-	-	-	-	-	2
CO-2	3	3	-	-	-	-	-	-	-	-	-	2
CO-3	3	3	-	-	-	-	-	-	-	-	-	2
CO-4	3	3	-	-	-	-	-	-	-	-	-	2
CO-5	3	3	-	-	-	-	-	-	-	-	-	2

**Note:** 3= Strong Contribution    2 = Average Contribution    1 = Weak Contribution    '-'= No Contribution

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### The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Course Code:	BEE401	TITLE: Electric Motors	Faculty Name:	Sowmyashree K S
List of Course Outcomes	Program Specific Outcomes			
	PSO1	PSO2		
CO-1	-	2		
CO-2	-	2		
CO-3	-	2		
CO-4	-	2		
CO-5	-	2		

**Note:** 3= Strong Contribution    2 = Average Contribution    1 = Weak Contribution    '-' = No Contribution